DRAFT RESOURCE ACTION DEVELOPMENT FOR GEOGRAPHIC AREA DISCUSSION: THE LOWER FEATHER RIVER DOWNSTREAM OF THE AFTERBAY OUTLET TO THE CONFLUENCE OF THE SACRAMENTO RIVER, THERMALITO COMPLEX INCLUDING THE DIVERSION POOL, THERMALITO FOREBAY, THERMALITO AFTERBAY AND THE OROVILLE WILDLIFE AREA

Oroville Facilities Relicensing
March 26th, 2003

- NOTE: This document provides initial suggestions of potential resource actions for the following areas: (1) lower Feather River downstream of the Afterbay, and (2) the Thermalito Complex. **Inclusion of actions in this document at this time does not denote support by any member of the Collaborative.**

- The potential resource impacts presented in this packet are based on draft impact statements developed for the Preliminary Draft Environmental Assessment (PDEA). These draft impact statements were compared with the CEQA checklist and contain all relevant issues identified during the scoping process.

- Discussions with technical resource experts, key results and information released to date, and a review of the study plans were used in this analysis for the geographical study area.

- Previously, the Environmental Workgroup (EWG) was presented similar information for the Low Flow Channel reach of the Feather River from the Fish Barrier Dam to the Thermalito Afterbay Outlet. Two additional areas are presented in this document 1) the remainder of the lower Feather River from the Thermalito Afterbay Outlet to the confluence of the Sacramento River, and 2) the Thermalito Complex which included the Diversion Pool, Thermalito Forebay, Thermalito Afterbay, and the Oroville Wildlife Area. It is anticipated that other potential impacts will come to light or that potential impacts listed here will be clarified or modified in future documents as more information becomes available. Time constraints limited this information review to four primary resource areas: fisheries and aquatics, terrestrial, hydrology and water quality, and geomorphology.

- This document describes the impact issues and potential resource actions for the Thermalito Complex, the Oroville Wildlife Area, and the Feather River below the Thermalito Afterbay Outlet. The remaining geographic areas will be addressed at future Environmental Workgroup meetings.

- Resource Goals listed in this document are taken from goals described by the Environmental Workgroup after meeting on January 21, 2003.

TABLE 1. List of study plans for Oroville Facilities Relicensing that are collecting data from 1) lower Feather River downstream of the Afterbay Outlet to the confluence of the Sacramento River , 2) Thermalito Forebay and Afterbay, and 3) Oroville Wildlife Area.

Study Plan ID	Title	Resource Area			
		Fisheries/Aquatics	Water Quality	Terrestrial	Geomorphology
SP-F1	Evaluation of Project effects on non-fish aquatic resources	X			
SP-F2	Evaluation of Project Effects on Fish Diseases	X			
SP-F3.2	Evaluation of Project Effects on non-salmonid fish in the Feather River Downstream of the Thermalito Diversion Dam	X			
SP-F8	Transfer of Energy and Nutrients by Anadromous Fish Migrations	X			
SP-F9	Evaluation of the Feather River Hatchery effects on naturally spawning salmonids	X			
SP-F10	Evaluation of project effects on salmonids and their habitat in the Feather River below the Fish Barrier Dam	X			X
SP-F16	Evaluation of project effects on instream flows and fish habitat	X			X
SP-F21	Project effects on predation of Feather River juvenile anadromous salmonids.	X			
SP-G2	Effects of Project Operations on Geomorphic Processes Downstream of Oroville Dam	X			X
SP-W1	Project effects on surface waters	X	X		
SP-W2	Contaminant Accumulation and Aquatic Food Chain	X			
SP-W5	Project effects on groundwater		X		
SP-W6	Project Effects on Temperature Regime	X	X		
SP-W9	Project Effects on Natural Protective Processes		X		
SP-T1	Effects of project features and operation on wildlife and wildlife habitat			X	
SP-T2	Project Effects on Special Status Species			X	
SP-T3/T5	Riparian resources, wetlands, and assoicated floodplains			X	
SP-T4	Biodiversity, vegetation communities, and wildlife habitat mapping			X	
SP-T7	Project effects on noxious terrestrial and aquatic plant species			X	
SP-T8	Project effects on non-native Wildlife			X	
SP-T9	Recreation and Wildlife			X	
SP-T10	Effects of Project features, operations, and maintenance on upland plant communites			X	
SP-T11	Effects of Fuel Load Management and Fire Prevention on Wildlife and Plant Communities			X	

I. Aquatic Resources

<u>Potential Impact:</u> Does the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status aquatic species in local or regional plans, policies, or regulations, or by the CDFG, NMFS, or USFWS?

Resource Goals:

1. Minimize and mitigate adverse project-related effects on fish aquatic resources.
2. Minimize and eliminate adverse project-related effects on fish due to disease within project waters and project affected waters.
3. Minimize and mitigate adverse project impacts on habitat, genetic integrity and population size of anadromous fish.

Technical Contacts:

Paul Bratovich	David Olsen
Terry Mills	Mike Perrone
Jim Sherar	Dave Bogener
MaryLou Keefe	Wayne Dyok
Gail Kuenster	

Relevant Study Plans:

SP-T1	SP-F10
SP-T2	SP-F16
SP-F1	SP-F2
SP-F3.1	SP-F21
SP-F3.2	

<u>1. Thermalito Complex</u>

The Thermalito Complex is not directly impacted through this Potential Impact because barriers prevent known threatened, endangered, and special status species in the Feather River from entering the Forebay and Afterbay.

Potential Resource Actions:

- None

<u>2. Oroville Wildlife Area</u>

Key Results/Information:

- Potential to affect other special status species, although species have yet to be determined.

Data Available:

- Draft of final report for effects of project operations on the fish diseases in the project area (SP-F2) completed in February 2003.
- Interim report issued 1/22/03 on evaluation of flow-related physical impediments in the Feather River below the Fish Barrier Dam (SP-F10 Task 1c). Evaluation of impediments

for Chinook salmon based on comparison of total Chinook salmon escapement to flow data water year type.
- Interim report issued 1/22/03 on literature review of life history and habitat requirements for Feather River fish species (SP-F3.2 Task 2 and SP-F21 Task 2).
- Report issues July 2002 on emigration of juvenile Chinook salmon in the Feather River, 1998-2001.

Data Forthcoming:
- Final report for SP-F9 scheduled for July 2004.
- Final Report for SP-F10 Task 1c scheduled for January 2004.
- Phase one report for evaluation of project effects on instream flows and fish habitat (SP-F16 Task 1 and 2) scheduled for June 2003.

Potential Resource Actions:
- Enhance riparian vegetation and trees along banks for shading and increased habitat complexity.

3. Downstream of the Afterbay Outlet to the confluence of the Sacramento River

Key Results/Information:
- Potential to affect listed aquatic run of salmon and steelhead, green sturgeon Delta smelt and Sacramento splittail.
- Potential to affect other special status species, although species have yet to be determined.

Data Available:
- Draft of final report for effects of project operations on the fish diseases in the project area (SP-F2) completed in February 2003.
- Interim report issued 1/22/03 on evaluation of flow-related physical impediments in the Feather River below the Fish Barrier Dam (SP-F10 Task 1c). Evaluation of impediments for Chinook salmon based on comparison of total Chinook salmon escapement to flow data water year type.
- Interim report issued 1/22/03 on distribution and habitat use of steelhead and other fishes in the lower Feather River, 1999-2001 (SP-F10 Task 3a). The report sought to identify factors potentially limiting steelhead success in the lower Feather River and described the characteristics of natural-origin steelhead in the reach. Multi-scale snorkeling and seining surveys were used to collect data.
- Interim report issued 1/22/03 on literature review of life history and habitat requirements for Feather River fish species (SP-F3.2 Task 2 and SP-F21 Task 2).
- Report issued August 2002 on distribution of fishes in the lower Feather River in relation to season and temperature, 1997-2001.
- Report issues July 2002 on emigration of juvenile Chinook salmon in the Feather River, 1998-2001.

Data Forthcoming:
- Final report for SP-F9 scheduled for July 2004.
- Final Report for SP-F10 Task 1c scheduled for January 2004.
- Final Report for SP-F10 Task 3a scheduled for December 2003.

- Phase one report for evaluation of project effects on instream flows and fish habitat (SP-F16 Task 1 and 2) scheduled for June 2003.

Potential Resource Actions:

- Add woody debris to stream reach to increase habitat complexity during juvenile fish rearing.
- Enhance riparian vegetation and trees along banks for shading and increased habitat complexity.

<u>Potential Impact</u>: Does the project interfere substantially with the movement of any native migratory fish or impede the use of native wildlife nursery sites for native aquatic species?

Resource Goals:

1. Minimize and mitigate adverse project impacts on habitat, genetic integrity, and population size of anadromous fishes.
2. Increase natural production of steelhead, spring-run Chinook salmon, fall-run Chinook salmon, and other anadromous fish.
3. Continued mitigation for loss of anadromous fish spawning habitat in the Feather River.
4. Enhance aquatic habitats through alteration of geomorphic processes.
5. Minimize and mitigate adverse project related effects on fish and aquatic resources.
6. Minimize and mitigate adverse project effects on regional fisheries and habitat.
7. Provide populations of anadromous fish sufficient to support desired recreational and commercial fisheries.
8. Minimize and mitigate adverse project-related effects on anadromous fish passage and ecological functions.
9. Provide populations of anadromous fish sufficient to support desired fisheries and ecological functions.
10. Provide for upstream passage of anadromous fish.

Technical Contacts:

David Olsen
Tom Payne
Eric See
Brad Cavallo
Koll Bruer
Jerry Boles

Relevant Study Plans:

SP-F3.1	SP-F3.2
SP-F10	SP-F15
SP-F21	SP-G2
SP-W6	

<u>1. Thermalito/Oroville Wildlife Area Complex</u>

Key Results/Information:

- Rapid water releases from Oroville Dam and subsequent flow changes in the lower Feather River could impact fish movement and/or migration.
- Predaceous fishes, hatchery-origin salmonids, and natural salmonids are allowed free access above Afterbay Outlet (in the Feather River Low Flow Channel) and intermingle to the detriment of wild fish populations.

Data Available:

- Interim report issued 1/22/03 on literature review of life history and habitat requirements for Feather River fish species (SP-3.2 Task 2 and SP-F21 Task 2).

Data Forthcoming:

- Final report for SP-F3.2 (Task 2) scheduled for December 2003 will provide data on distribution and biology of non-salmonid fishes.
- SP-21 will provide information on predator/prey relationships and potential habitat considerations.

Potential Resource Actions:

- Provide attraction flows to encourage upstream migration of anadromous fishes. Also to allow passage over barriers in lower Feather River.
- Incorporate habitat considerations into management of flow operations in addition to storage and water quality concerns.

2. Downstream of the Afterbay Outlet to the confluence of the Sacramento River

Key Results/Information:

- Flows influence attraction of adult upmigrant anadromous fish, outmigration timing, fish passage, and survival of juvenile and adult fishes in Feather River.
- Rapid water releases from Oroville Dam and subsequent flow changes in the lower Feather River could impact fish movement and/or migration.
- Predaceous fishes, hatchery-origin salmonids, and natural salmonids are allowed free access above Afterbay Outlet (in the Feather River Low Flow Channel) and intermingle to the detriment of wild fish populations.
- No consistent temporal pattern among flow and escapement that might be suggestive of potential flow-related physical impediments to upstream passage of adult salmonids.
- Under low flow condition, Shanghai Bench and Sunset Pumps may be impassable for some fishes, including green sturgeon and Sacramento splittail due to water velocities in some areas and vertical height barrier.
- Genetic integrity of spring-run and fall-run Chinook salmon in Feather River may be deteriorating because of overlapping spawning areas and lack of physical separation of the two runs in the Feather River (i.e., passage barriers prevent movement into historical spawning areas).

Data Available:

- Interim report issued 1/22/03 on distribution and habitat use of steelhead and other fishes in the lower Feather River, 1999-2001 (SP-F10 Task 3a).
- Interim report issued 1/22/03 on literature review of life history and habitat requirements for Feather River fish species (SP-3.2 Task 2 and SP-F21 Task 2).
- Interim report issued 1/22/03 on evaluation of flow-related physical impediments in the Feather River below the Fish Barrier Dam (SP-F10 Task 1c). Evaluation of impediments for Chinook salmon based on comparison of total Chinook salmon escapement to flow data water year type.
- Report issued August 2002 on distribution of fishes in the lower Feather River in relation to season and temperature, 1997-2001.
- Report issues July 2002 on emigration of juvenile Chinook salmon in the Feather River, 1998-2001.

Data Forthcoming:

- Final report for passage impediments (SP-F3.2 Task 3a) expected in Summer 2003.
- Final report for SP-F10 Task 1c scheduled for January 2004.

- Final report for SP-F10 Task 3a scheduled for December 2003.
- SP-F10 will provide data on salmonids and their habitat in the Feather River.
- Final report for SP-F3.2 (Task 2) scheduled for December 2003 will provide data on distribution and biology of non-salmonid fishes.
- SP-21 will provide information on predator/prey relationships and potential habitat considerations.

Potential Resource Actions:

- Provide pulse flows to create productive rearing habitat (off-channel areas, floodplains), and encourage upstream migration of adult fishes (salmon, sturgeon, splittail, shad, etc). Also, to allow passage over barriers in lower Feather River.
- Incorporate habitat considerations into management of flow operations in addition to storage and water quality concerns.
- In response to genetic and spawning habitat limitation, construct weir at downstream end of low-flow reach to selectively pass fish upstream.
- Investigate flow velocities on the Feather River at Sunset Pumps for fish passage.
- Reduce flow velocities at Sunset Pumps to allow for the spilittail and green sturgeon to pass.
- Structurally modify the Sunset Pumps area to aid passage of green sturgeon and splittail.
- Modify Shanghai Bench to aid passage of splittail and sturgeon.
- Construct fish ladder into Fish Barrier Pool for use as holding habitat for spring run Chinook salmon. Develop operational strategy or facilities to convey spring-run salmon to hatchery from Fish Barrier Pool.

Potential Impact: Does the project have the potential to substantially reduce the habitat of fish species?

Resource Goals:

1. Minimize or mitigate adverse project related effects on the habitat of resident fish.
2. Evaluation of project effects on the spawning, incubation, and initial rearing period of anadromous salmonids in the Feather River.
3. Evaluate the timing, magnitude and frequency of flows and water temperature and their effects on anadromous salmonid egg and alevin survival.
4. Evaluate project operation flow fluctuation-related effects on redd dewatering and fry stranding.

Technical Contacts:

Paul Bratovich
David Olsen
Mike Perrone
Koll Bruer
Tom Payne
MaryLou Keefe
Brad Cavallo
Gail Kuenster

Relevant Study Plans:

SP-G2
SP-T2
SP-T4
SP-F3.1
SP-F3.2

1. Thermalito/Oroville Wildlife Area Complex

Key Results/Information:

- In some Oroville Wildlife Area (OWA) ponds, aquatic weeds eliminate open-water habitat for fish species.

Data Available:

- Interim report issued 1/22/03 on literature review of life history and habitat requirements for Feather River fish species (SP-F3.2 Task 2 and SP-F21 Task 2).

Data Forthcoming:

- SP-T7 will include the distribution of noxious weeds
- SP-T4 will include the distribution of vegetation within the Oroville Wildlife Area.

Potential Resource Actions:

- Control aquatic weeds to enhance fish habitat in OWA.

2. Downstream of the Afterbay Outlet to the confluence of the Sacramento River

Key Results/Information:

- Spawning habitat quality may be reduced do to armoring and winnowing of fines resulting from lack of gravel recruitment.
- The lower Feather River below the Afterbay Outlet can undergo rapid flow changes associated with Project operations. For example, in mid-February 2003, flows in the lower section changed from 1,250 cfs to >8,000 cfs within 24 hours. This has the potential to negatively impact fish resources.
- Lack of off-channel habitat has been hypothesized to negatively affect the abundance and distribution of salmonids and other fishes in the Feather River reach below the Afterbay Outlet.

Data Available:

- Review and evaluation of steelhead spawning survey methodology was completed in October 2002.
- Interim report issued 1/22/03 on literature review of life history and habitat requirements for Feather River fish species (SP-F3.2 Task 2 and SP-F21 Task 2).

Data Forthcoming:

- Characterize fish composition and habitat, describe influence of project operations at the Thermalito Complex (SP-F3.1 Task 3-5).
- Carcass survey results and analysis, steelhead redd survey analysis, and superimposition index will be completed in May 2003.
- Interim report including analysis of 1st year of field data plus reviews and evaluations of existing data for SP-F10 (Task 2A-D) will be completed in June 2003.
- Interim report for redd dewatering for SP-F10 (Task 2A-D) will be completed in July 2003.

Potential Resource Actions:

- Improve side-channel habitat for rearing fishes in lower Feather River within Project boundary.
- Increase connectivity between river channel and lateral habitats (e.g., floodplains, side channels) in lower Feather River by removing levees to create seasonal habitats for salmon, splittail and other fishes.
- Provide additional floodplain habitats adjacent to the river channel additional releases from Thermalito Outlet or Thermalito Diversion Dam.
- Provide early spring-winter (February-May) high flow pulses to restore geomorphic process, improve spawning habitat, and inundate floodplains to provide high quality rearing habitat.

Potential Impact: Does the project have a substantial adverse effect on fishes by altering conditions (e.g., flow and water temperature) to favor warm water predatory fishes in the lower Feather River?

Resource Goals:

1. Minimize and mitigate adverse project related effects on fish and aquatic resources.
2. Minimize and mitigate adverse project impacts on habitat, genetic integrity and population size of anadromous fishes.
3. Restore populations of anadromous fishes.
4. Minimize adverse project impacts that increase predation pressure on salmonid and other species beyond natural or expected rates.

Technical Contacts:

Paul Bratovich	Mike Perrone
Tom Payne	Brad Cavallo
Jerry Boles	Dave Bogener

Relevant Study Plans:

SP-T1
SP-W3.1
SP-W6
SP-F1
SP-F10
SP-F21

1. Lower Feather River

Key Results/Information:

- Discontinuity in flow and water temperature at the Thermalito Outlet may increase predation risk for migrating juvenile salmonids and other fishes.
- Predatory fishes, particularly native species Sacramento pikeminnow, are generally more abundant downstream of the Thermalito Outlet, where summer water temperatures are warmer.
- Possibility that bass move from the Afterbay to the lower Feather River and interact with migrating salmonids.

Data Available:

- Interim report issued 1/22/03 on evaluation of flow-related physical impediments in the Feather River below the Fish Barrier Dam (SP-F10 Task 1c). Evaluation of impediments for Chinook salmon based on comparison of total Chinook salmon escapement to flow data water year type.
- Interim report issued 1/22/03 on distribution and habitat use of steelhead and other fishes in the lower Feather River, 1999-2001 (SP-F10 Task 3a). The report sought to identify factors potentially limiting steelhead success in the lower Feather River and described the characteristics of natural-origin steelhead in the reach. Multi-scale snorkeling and seining surveys were used to collect data.
- Final report for effects of fisheries management plans on a balanced fishery (SP-F5) was completed in June 2002.

- Report issued August 2002 on distribution of fishes in the lower Feather River in relation to season and temperature, 1997-2001.
- Report issues July 2002 on emigration of juvenile Chinook salmon in the Feather River, 1998-2001.

Data Forthcoming:

- Final report for effects of existing and future project operations on fish and aquatic resources (SP-F1) scheduled for June 2004.
- Final report for SP-F10 Task 1c scheduled for January 2004.
- Final report for SP-F10 Task 3a scheduled for December 2003.
- Phase 1 report for evaluation of project effects on instream flows and fish habitat scheduled for June 2003.
- General literature review to identify potential predators of Feather River anadromous salmonids, and describe main characteristics of their life history. A final report will be completed by December 2003 (SP-F21, Task 2).
- Produce estimates of losses to predation based on other experiments or model. A final report will be completed by December 2003 (SP-F21, Task 3).

Potential Resource Actions:

- Manage project operations to minimize flow and temperature discontinuities present at the Thermalito Outlet. In particular, during summer months, release cooler waters from the Thermalito Outlet to reduce discontinuity with the Low Flow Channel and push zone of elevated predation pressure further downstream.

<u>Potential Impact:</u> Do managed fisheries in Thermalito Forebay and Afterbay affect the genetic integrity, abundance, and/or distribution of fishes?

Resource Goals:

1. Minimize or mitigate adverse project effects on the habitat of resident fish.
2. Minimize or eliminate adverse project related effects on fish due to diseases within project waters and project affected waters.
3. Minimize impact of stocked resident and introduced fish on wild salmonids.
4. Provide a balanced warm and cold water fishery.
5. Minimize and mitigate hatchery impacts on naturally produced salmonids.
6. Minimize and mitigate adverse project impacts on habitat, genetic integrity and population size of listed species.

Technical Contacts:

Paul Bratovich
Mike Perrone
MaryLou Keefe
Gail Kuenster

Relevant Study Plans:

SP-F1
SP-F2
SP-F3.2
SP-F10
SP-F16
SP-T4

<u>1. Thermalito/Oroville Wildlife Area Complex</u>

Only the Thermalito/OWA Complex has been evaluated for this potential impact.

Key Results/Information:

- There is connectivity between the Thermalito Forebay and Fish Barrier Pool.
- Thermalito Forebay and Afterbay managed similarly to OWA as "managed fisheries".
- No special status fish issues in Forebay or Afterbay.
- Rainbow trout "put and take" fishery present in Thermalito Forebay.
- Thermalito Afterbay can sustain warm and cold water fisheries.
- In Afterbay, disease concerns may be present (*C. shasta*) and fluctuating water levels can force fish into sub-optimal habitat.
- Possibility that predators move from the Afterbay to the lower Feather River and interact with migrating salmonids.
- OWA ponds suitable habitat for warm-water species and some salmonids.

Data Available:

- Draft of final report for effects of project operations on the fish diseases in the project area (SP-F2) completed in February 2003.
- Final report for effects of fisheries management plans on a balanced fishery (SP-F5) was completed in June 2002.

- Interim report issued 1/22/03 on distribution and habitat use of steelhead and other fishes in the lower Feather River, 1999-2001 (SP-F10 Task 3a). The report sought to identify factors potentially limiting steelhead success in the lower Feather River and described the characteristics of natural-origin steelhead in the reach.
- Report issued August 2002 on distribution of fishes in the lower Feather River in relation to season and temperature, 1997-2001.
- Report issues July 2002 on emigration of juvenile Chinook salmon in the Feather River, 1998-2001.

Data Forthcoming:

- Characterize fish composition and habitat, describe influence of project operations at the Thermalito Complex (SP-F3.1 Task 3-5).
- Hatchery effects evaluation (SP-F9) will provide data on Feather River Hatchery operations, cohort analysis, densities in wild, and results of study on virulence of Feather River Type II-strain IHN. Final report will be completed in July 2004.
- Final Report for SP-F10 Task 3a scheduled for December 2003.

Potential Resource Actions:.

- Cease fish planting into the Thermalito Complex that may have a deleterious on wild fishes in the Feather River.
- Install a device at the Thermalito Outlet that will prevent downstream passage of planted fishes from the Thermalito Afterbay into the Feather River.

<u>Potential Impact:</u> Does the project have a substantial adverse effect on fish species as related to hatchery operations and disease concerns in the Feather River?

Resource Goals:

1. Minimize or eliminate adverse project related effects on fish due to diseases within project waters and project affected waters.
2. Initiate efforts to minimize or eliminate adverse project related effects due to IHN within project waters, and project affected waters prior to license application submittal.
3. Promote/enhance healthy freshwater and ocean fishery.
4. Minimize and mitigate hatchery impacts on naturally produced salmonids.

Technical Contacts:

Randy Brown
Mike Perrone
Brad Cavallo
Carin Loy
MaryLou Keefe
Jerry Boles

Relevant Study Plans:

SP-F2
SP-F3.2
SP-F9
SP-F10
SP-F16
SP-W1
SP-W6

<u>1. The Feather River</u>

Key Results/Information:

- Wild fish serve as a natural reservoir for pathogens.
- No evidence to suggest wild disease outbreaks in native fisheries or disease-related wild fish kills in native fisheries occurred in this reach.
- Feather River Fish Hatchery disease outbreaks associated with multiple factors, including water temperature, pathogen presence in waters, and stocking susceptible salmonids above Oroville Dam and the hatchery intake.
- Natural occurrence of pathogens in Feather River. Minor risk of disease amplification associated with Project if temperature and/or water quality degrades in Feather River.
- IHN and *C. shasta* most important diseases that require management action in project waters.
- Studies show that the Nimbus strain of IHN not transmitted from hatchery to wild fish.
- Although pathogens have been detected in wild, no evidence of disease outbreaks in Feather River.

Data Available:

- Draft of final report for effects of project operations on the fish diseases in the project area (SP-F2) completed in February 2003. Final disease report released as information from other reports is finalized.

Data Forthcoming:

- Hatchery effects evaluation (SP-F9) will provide data on Feather River Fish Hatchery operations, cohort analysis, densities in wild, and results of study on virulence of Feather River Type II-strain IHN. Final report will be completed in July 2004.
- SP-W1 will provide information on water temperature, toxicity, pesticides, bacteria, and inorganic chemistry of water for eight sites in low-flow reach. These sites are labeled Site 21-28 in SP-W1. Final report due in 2004.
- SP-W6 will provide data on water temperature.

Potential Resource Actions:

- Evaluate all proposed actions for relevance to fish disease concerns.
- Release hatchery steelhead at a smaller size so they do not present a predation problem for wild salmonids.
- Decrease hatchery production of salmon so that there is less crowding and competition for limited spawning habitat in the Feather River.
- Use a weir to restrict access of hatchery fish to parts of the Feather River. This would reduce genetic introgression between races and between hatchery/wild salmonids. This would also reduce crowding and competition for limited spawning habitat.

II. Terrestrial Biological Resources

<u>Potential Impact:</u> Does the project have the potential to degrade the quality of wildlife habitat by altering the establishment or disbursement of noxious terrestrial and aquatic plant species?

Resource Goals:

1. Minimize and mitigate project-related effects on the dispersal of noxious weeds.
2. Incorporate project lands in countywide mapping process of noxious weeds.
3. Control noxious weeds of greatest ecological and agricultural concern.
4. Remove undesirable non-native plant species around lake, river, forebay, and afterbay areas, especially star thisle, ailanthus, and other invasive plant species.
5. Restore disturbed sites with native plant communities.
6. Minimize and mitigate project-related effects on dispersal of noxious aquatic weeds into downstream irrigation canals.

Technical Contacts:

Jim Sherar
Dave Bogener
Gail Kuenster
Carin Loy
Dave Stevens

Relevant Study Plans:

SP-T3/5
SP-T2
SP-T4
SP-T6
SP-T7
SP-T10

<u>1. Thermalito Complex</u>

Key Results/Information:

- Star thistle and purple loose strife are present in the Thermalito Complex.

Data Available:

- Final results are not available at this time.

Data Forthcoming:

- SP-T4 will provide vegetation mapping data, wildlife/habitat relationships, will identify high value and vulnerable habitats, as well as evaluate Project effects.
- SP-T6 will generate a wildlife management plan for lands within the Project area.
- SP-T7 will provide maps of current distribution of noxious species.
- SP-T10 will identify and evaluate project effects on upland plant communities, including appropriate opportunities for revegetation and/or restoration.

Potential Resource Actions:

- Eliminate noxious plants via herbicidal treatment or mechanical control (may require continued maintenance due to periodic high-flow events).
- Develop construction and recreational management protocols to control the spread of noxious species.
- Develop flow regimes to manage establishment of noxious species.

2. Oroville Wildlife Area

Key Results/Information:

- Star thistle and purple loose strife are present in the OWA.

Data Available:

- Final results are not available at this time.

Data Forthcoming:

- SP-T4 will provide vegetation mapping data, wildlife/habitat relationships, will identify high value and vulnerable habitats, as well as evaluate Project effects.
- SP-T6 will generate a wildlife management plan for lands within the Project area.
- SP-T7 will provide maps of current distribution of noxious species.
- SP-T10 will identify and evaluate project effects on upland plant communities, including appropriate opportunities for revegetation and/or restoration.

Potential Resource Actions:

- Eliminate noxious plants via herbicidal treatment or mechanical control (may require continued maintenance due to periodic high-flow events).
- Develop construction and recreational management protocols to control the spread of noxious species.

3. Downstream of the Afterbay Outlet to the confluence of the Sacramento River

Key Results/Information:

- Tree of heaven, scarlet wysteria, and giant reed are present in this Feather River reach.

Data Available:

- Final results are not available at this time.

Data Forthcoming:

- SP-T3/5 will provide data on wetland, riparian, and floodplain habitat conditions and will evaluate project-related impacts to wetland communities, hydrologic criteria, and habitats.
- SP-T4 will provide vegetation mapping data, wildlife/habitat relationships, will identify high value and vulnerable habitats, as well as evaluate Project effects.
- SP-T6 will generate a wildlife management plan for lands within the Project area.
- SP-T7 will provide maps of current distribution of noxious species.
- SP-T10 will identify and evaluate project effects on upland plant communities, including appropriate opportunities for revegetation and/or restoration.

Potential Resource Actions:

- Eliminate noxious plants via herbicidal treatment or mechanical control (may require continued maintenance due to periodic high-flow events).
- Develop construction and recreational management protocols to control the spread of noxious species.
- Develop flow regimes to manage establishment of noxious species.

Potential Impact: Does the project have a substantial adverse effect, either directly or through habitat modification, on any special status plant or animal species?

Resource Goals:

1. Minimize and mitigate adverse project effects on special status plant and animal species.
2. Promote the expansion of sensitive species.

Technical Contacts:

Jim Sherar
Dave Bogener
Gail Kuenster

Relevant Study Plans:

SP-T1
SP-T2
SP-T3/5
SP-T7
SP-T9

1. Thermalito Complex

Key Results/Information:

- Presence of valley elderberry longhorn beetle (VELB), Swanson's hawk, and bank swallow.
- Potential to affect other special status plant or wildlife species, although species yet to be determined.

Data Available:

- Interim report on SP-T2 released on 1/22/03 includes reports of wildlife survey conducted in 2002.

Data Forthcoming:

- SP-T1 will identify project-related effects on wildlife habitat including habitat loss or fragmentation.
- SP-T2 will identify threatened, endangered, or special status species and potential project impacts.
- SP-T3/5 will provide data on wetland, riparian, and floodplain habitat conditions and will evaluate project-related impacts to wetland communities, hydrologic criteria, and habitats.
- SP-T7 will provide maps of current distribution of noxious species.
- SP-T9 will provide information on recreation/wildlife conflicts and loss of habitat due to recreational activities and facilities.
- Final results are not expected until late 2003 and early 2004.

Potential Resource Actions:

- Develop maintenance and recreational management protocols to avoid impact to special status species within the Thermalito Complex

2. Oroville Wildlife Area

Key Results/Information:

- Presence of western yellow-billed cuckoo (potentially), valley elderberry longhorn beetle (VELB), Swanson's hawk, and bank swallow.
- Potential to affect other special status plant or wildlife species, although species yet to be determined.

Data Available:

- Interim report on SP-T2 released on 1/22/03 includes reports of wildlife survey conducted in 2002.

Data Forthcoming:

- SP-T1 will identify project-related effects on wildlife habitat including habitat loss or fragmentation.
- SP-T2 will identify threatened, endangered, or special status species and potential project impacts.
- SP-T3/5 will provide data on wetland, riparian, and floodplain habitat conditions and will evaluate project-related impacts to wetland communities, hydrologic criteria, and habitats.
- SP-T7 will provide maps of current distribution of noxious species.
- SP-T9 will provide information on recreation/wildlife conflicts and loss of habitat due to recreational activities and facilities.
- Final results are not expected until late 2003 and early 2004.

Potential Resource Actions:

- Enhance or add riparian habitat for threatened, endangered, or special status species (i.e. yellow-billed cuckoo)(may require continued maintenance due to periodic high-flow events).
- Develop hydrologic regime to foster the establishment of riparian vegetation.
- Develop maintenance and recreational management protocols to avoid impact to special status species within OWA.

3. Downstream of the Afterbay Outlet to the confluence of the Sacramento River

Key Results/Information:

- Presence of western yellow-billed cuckoo (potentially), valley elderberry longhorn beetle (VELB), Swanson's hawk, and bank swallow.
- Potential to affect other special status plant or wildlife species, although species yet to be determined.

Data Available:

- Interim report on SP-T2 released on 1/22/03 includes reports of wildlife survey conducted in 2002.

Data Forthcoming:

- SP-T1 will identify project-related effects on wildlife habitat including habitat loss or fragmentation.
- SP-T2 will identify threatened, endangered, or special status species and potential project impacts.
- SP-T3/5 will provide data on wetland, riparian, and floodplain habitat conditions and will evaluate project-related impacts to wetland communities, hydrologic criteria, and habitats.
- SP-T7 will provide maps of current distribution of noxious species.
- SP-T9 will provide information on recreation/wildlife conflicts and loss of habitat due to recreational activities and facilities.
- Final results are not expected until late 2003 and early 2004.

Potential Resource Actions:

- Enhance or add riparian habitat for threatened, endangered, or special status species (i.e. yellow-billed cuckoo) (may require continued maintenance due to periodic high-flow events).
- Develop hydrologic regime to foster the establishment of riparian vegetation.
- Develop hydrologic regime that creates nesting habitat for bank swallows.

Potential Impact: Does the project interfere substantially with the movement of any wildlife species, or with established native resident or migratory wildlife corridors associated with project lands or project facilities?

Resource Goals:

1. Minimize and mitigate project related recreation impacts on wildlife and plant communities.
2. Enhance nesting and wintering habitat for Pacific Flyway waterfowl and related plant communities.

Technical Contacts:

Jim Sherar
Dave Bogener
Dave Stevens

Relevant Study Plans:

SP-T1
SP-T2
SP-T7
SP-T9

1. Thermalito Complex

Key Results/Information:

- Likely minor impacts on the movement of wildlife due to recreation.

Data Available:

- Final results are not available at this time.

Data Forthcoming:

- SP-T1 will identify project-related effects on wildlife habitat including habitat loss or fragmentation.
- SP-T2 will identify special status species and potential project impacts.
- SP-T7 will provide maps of current distribution of noxious species.
- SP-T9 will provide information on recreation/wildlife conflicts and loss of habitat due to recreational activities and facilities.
- Results are not expected until late 2003 and early 2004.

Potential Resource Actions:

- Modify recreational use patterns in the Thermalito Complex to minimize impacts to important terrestrial species (exact measures dependent on analysis in upcoming report).
- Provide improved vegetation cover and screening within important corridors.

2. Oroville Wildlife Area

Key Results/Information:

- Likely minor impacts on the movement of wildlife due to recreation.

Data Available:

- Final results are not available at this time.

Data Forthcoming:

- SP-T1 will identify project-related effects on wildlife habitat including habitat loss or fragmentation.
- SP-T2 will identify special status species and potential project impacts.
- SP-T7 will provide maps of current distribution of noxious species.
- SP-T9 will provide information on recreation/wildlife conflicts and loss of habitat due to recreational activities and facilities.
- Results are not expected until late 2003 and early 2004.

Potential Resource Actions:

- Modify recreational use within the OWA to minimize impacts to important terrestrial species (exact measures dependent on analysis in upcoming report).
- Provide improved vegetation cover and screening within important corridors.

3. Downstream of the Afterbay Outlet to the confluence of the Sacramento River

Key Results/Information:

- Likely minor impacts on the movement of wildlife due to recreation.

Data Available:

- Final results are not available at this time.

Data Forthcoming:

- SP-T1 will identify project-related effects on wildlife habitat including habitat loss or fragmentation.
- SP-T2 will identify special status species and potential project impacts.
- SP-T7 will provide maps of current distribution of noxious species.
- SP-T9 will provide information on recreation/wildlife conflicts and loss of habitat due to recreational activities and facilities.
- Results are not expected until late 2003 and early 2004.

Potential Resource Actions:

- Modify recreational use patterns in Feather River reach to minimize impacts to important terrestrial species (exact measures dependent on analysis in upcoming report).
- Provide improved vegetation cover and screening within important corridors.

Potential Impact: Does the project have the potential to alter the recruitment pattern for wetland and riparian vegetation?

Resource Goals:

1. Minimize and mitigate adverse project related effects on riparian and wetland ecosystems along the Feather River.
2. Enhance riparian and wetland habitats including floodplain and upland wetlands, vernal pools, and brood ponds within the project boundary.

Technical Contacts:

Jim Sherar
Gail Kuenster
John Cannon
Carin Loy
Eric Clyde

Relevant Study Plans:

SP-T3/5
SP-G2
SP-E1.2/E1.6
SP-E2
SP-T4

1. Thermalito Complex

Key Results/Information:

- Limited habitat use along Forebay due to high recreation levels; and limited wetland habitat.

Data Available:

- Final results are not available.

Data Forthcoming:

- SP-T4 will provide mapping of wetland habitats with the Thermalito Complex.
- SP-T3/5 will evaluate wetland conditions within the Thermalito Complex.

Potential Resource Actions:

- Develop management protocols to avoid maintenance/operational impacts on wetlands.

2. Oroville Wildlife Area

Key Results/Information:

- Diversity of wetland riparian within the Oroville Wildlife Area.

Data Available:

- Final results are not available at this time.

Data Forthcoming:

- SP-T3/5 will provide data on wetland, riparian, and floodplain habitat conditions and will evaluate project-related impacts to wetland communities, hydrologic criteria, and habitats.
- SP-G2 will provide data on sediment transport and substrate suitability.
- SP-E 1.2/SP-E 1.6/SP-E2 will provide qualitative data on hydrology in this run of the Feather River.
- SP-T4 will provide detailed mapping of riparian communities along the river.

Potential Resource Actions:

- Develop a hydrologic regime to support natural regeneration of riparian vegetation along the Feather River.
- Develop a management plan for gravel extraction areas that provides a framework for wetland/riparian habitat creation.
- Develop maintenance and operations protocols that avoid impacts to wetland and riparian habitats.

3. Downstream of the Afterbay Outlet to the confluence of the Sacramento River

Key Results/Information:

- Diversity of riparian habitats along the Feather River downstream from the Afterbay Outlet to Honcut Creek.

Data Available:

- Final results are not available at this time.

Data Forthcoming:

- SP-T3/5 will provide data on wetland, riparian, and floodplain habitat conditions and will evaluate project-related impacts to wetland communities, hydrologic criteria, and habitats.
- SP-G2 will provide data on sediment transport and substrate suitability.
- SP-E 1.2/SP-E 1.6/SP-E2 will provide qualitative data on hydrology in this run of the Feather River.
- SP-T4 will provide detailed mapping of riparian communities along the river.

Potential Resource Actions:

- Develop a hydrologic regime to support natural regeneration of riparian vegetation along the Feather River.

III. Hydrology and Water Quality

<u>Potential Impact:</u> Does the project have substantial adverse effects on water temperatures in project waters in the Feather River that might impact fish species, agriculture, or violate state standards?

Resource Goals:

1. Minimize and mitigate adverse project effects on water temperatures needed to protect beneficial uses.
2. Maintain suitable water temperatures in waters affected by the project to protect beneficial uses.

Technical Contacts:

Jerry Boles
Mike Perrone
MaryLou Keefe
Wayne Dyok

Relevant Study Plans:

SP-F3.1
SP-F3.2
SP-F9
SP-W6

<u>1. Thermalito Complex</u>

Key Results/Information:

- Water temperatures too low for rice farmers during early part of irrigation season. (Their water rights don't necessarily include a right to a specific water temperature.)
- Data will be collected and compared with the criteria for beneficial uses identified in the Basin Plan.

Data Available:

- Quarterly progress reports associated with SP-W1.

Data Forthcoming:

- Interim water quality report scheduled for release in April 2003. This report will contain information on water temperature for eight sites in low-flow reach. These sites are labeled Site 21-28 in SP-W1. Final report due in 2004.
- Water temperature data and hatchery studies are to become available in March 2003.
- Water temperature data from Thermalito Afterbay.

Potential Resource Actions:

- Change location of the agricultural diversions to reduce temperatures in lower Feather River and increase the temperature of the water diverted to irrigation districts.
- Modify pump-back operations to increase water temperatures.
- Modify configuration of Thermalito Afterbay to increase residence time of irrigation water.

2. Downstream of the Afterbay Outlet to the confluence of the Sacramento River

Key Results/Information:

- Increasing water temperatures in low flow reach to benefit agriculture likely has negative impacts to fisheries resources and potentially water quality in the reach.
- Data will be collected and compared with the criteria for beneficial uses identified in the Basin Plan.

Data Available:

- Quarterly progress reports associated with SP-W1.
- Water temperature plots for four sites in Feather River between Fish Barrier Dam to Afterbay Outlet (plots may change based on data availability).

Data Forthcoming:

- Interim water quality report scheduled for release in April 2003. This report will contain information on water temperature for eight sites in low-flow reach. These sites are labeled Site 21-28 in SP-W1. Final report due in 2004.

Potential Resource Actions:

- Decrease residence time in the Thermalito Complex to provide cooler water temperatures to lower Feather River and Thermalito waters; cooler temperatures are generally beneficial to salmonids and other fish species.
- Modify configuration of Thermalito Afterbay to channel colder water towards Afterbay Outlet.
- Re-operate Thermalito Afterbay pump-back operations to provide colder water to Lower Feather River.

Potential Impact: Does the project have adverse effects on water quality in the Thermalito Complex, Oroville Wildlife Area, or the Lower Feather River?

Resource Goals:
Resource Goals:

1. Minimize and mitigate adverse project effects on water quality to protect all beneficial uses.
2. Ensure project related activities maintain or improve water quality to protect beneficial uses and meet or exceed State and other applicable objectives, goals, and criteria.
3. Minimize and mitigate adverse project effects on water quality.
4. Ensure that water quality factors controllable by the project comply with Basin Plan objectives.
5. Minimize and mitigate adverse project effects on the physical, chemical, and biological integrity of water in Oroville Reservoir, its tributaries, and the Feather River.
6. Ensure factors controllable by the project sustain the physical, chemical, and biological integrity of water in Oroville Reservoir, its tributaries, and the Feather River.
7. Minimize and mitigate adverse effects of project operations, facilities, and recreation features on water quality.
8. Enhance water quality to the extent possible with project operations to protect beneficial uses.
9. Operate project related recreational facilities and activities to protect suitability of project waters for all beneficial uses.
10. Adequate facilities and measures for safe handling of sanitary and commercial wastes from residential or commercial developments adjacent to project waters.
11. Minimize project effects, to the extent possible, upon bioaccumulation in the aquatic food chain of metals and other toxic contaminants.
12. Minimize and mitigate adverse project related land management activities on water quality, slope stability, erosion, sedimentation, channel stability, riparian habitat, fish habitat, and other beneficial uses.
13. Protect riparian areas and water quality by limiting disturbance in streamside management zones according to ground slope and stability, stream class, channel stability, fishery, and other beneficial uses.
14. Avoid water quality degradation by using Best Management Practices during land management activities.
15. Reduce sedimentation and channel erosion by rehabilitating deteriorating watersheds.
16. Minimize and mitigate adverse project effects on natural hydrology.
17. Restore more natural hydrograph to the extent possible consistent with project purposes.
18. Minimize and mitigate adverse project effects on natural protective processes.
19. Enhance natural processes for maintaining water quality.

Key Results/Information:

- The beneficial uses for the Lake Oroville and Feather River downstream as defined in the Basin Plan include municipal and domestic supply, agriculture, electrical power production, contact and non-contact recreation, warm-water and cold-water fish spawning, rearing and migration, cold and warm freshwater habitat, and wildlife habitat.
- Specific compliance issues for project waters include bacteria, chemical constituents, dissolved oxygen, pH, oil and grease, pesticides, sediment, temperature, toxicity, and turbidity.

- Proximity of project features and recreational facilities to shoreline and banks of water bodies offers potential for introduction of nutrients and bacterial contaminants to the Feather River waters.
- Within the project boundary, the Feather River water quality can be affected by land management and watershed management activities (including waste disposal and pesticide use), slope stability, erosion, sedimentation, channel stability, riparian habitat, fisheries populations and other beneficial uses.
- Issues of concern for the Feather River include natural (unimpaired) hydrology, aquatic ecosystem health, natural protective processes (e.g., marshes).

Technical Contacts:

Jerry Boles
Mike Parrone
Brad Cavallo

Relevant Study Plans:

SP-F3.1
SP-F3.2
SP-F15

Data Available:

- Quarterly progress reports associated with SP-W1

Data Forthcoming:

- Interim water quality report scheduled for release in April 2003. This report will contain information on compliance with basin plan standards for water temperature, toxicity, pesticides, bacteria, and inorganic chemistry. Final report due in 2004.
- SP-W3 will provide an evaluation of effects of water quality due to recreation and recreational facilities, including recreation facilities and activities along the Feather River below the Thermalito Afterbay Outlet.
- SP-W7 will provide an evaluation of effects on water quality along the Feather River due to land management activities.
- SP-W9 will provide an assessment of project related effects on natural protective processes of the Feather River downstream of the Thermalito Afterbay Outlet.

Potential Resource Action:

- Potential resource actions for this reach of the river will be developed based on study plan results.

IV. Geomorphology

<u>Potential Impact:</u> Does the project have a substantial adverse effect on dynamic stream processes (e.g., sediment transport, woody debris recruitment) and thus fish abundances in the lower Feather River?

Resource Goals:

1. Minimize and mitigate adverse project impacts on habitat, genetic integrity, and population size of anadromous fishes.
2. Minimize or mitigate adverse project-related effects on the habitat of resident fish.
3. Enhance habitat for resident aquatic species.
4. Provide for upstream passage of anadromous fish.

Technical Contacts:

Tom Payne
Jerry Boles
Koll Bruer
Richard Harris
MaryLou Keefe

Relevant Study Plans:

SP-F3.1
SP-F3.2
SP-F10
SP-W6
SP-W1

Key Results/Information:

- Substrate in many areas is heavily armored and generally poor for salmonid spawning.
- Steelhead rearing and spawning occurs primarily in upper end of reach (SP-F10 Task 3A).
- Juvenile steelhead disperse downstream in the reach and grow faster and generally larger than fish in margin habitats in the lower reach (SP-F10 Task 3A).
- Water temperatures and flow conditions suitable for steelhead, absence or rarity of side channels and tributaries in reach, may be a limiting factor in the low production of steelhead juveniles (SP-F10 Task 3A).
- Water temperatures and geomorphology of the low-flow reach are affected by Oroville facilities operations.
- Current rotary screw trap efficiencies in Feather River are higher than in other river systems, but the available data is insufficient to develop population estimates SP-F10 (Task 4A).
- Physical modifications and enhancements to current rotary screw traps may provide small benefits, but these notions are largely experimental SP-F10 (Task 4A).
- Rotary screw traps immediately upstream of the Afterbay Outlet (RM 59.8) have been somewhat successful SP-F10 (Task 4A).

- Snorkel and seining surveys indicate that most young-of-year steelhead are found in the river reach as compared to below the Afterbay Outlet SP-F10 (Task 4A).

Data Available:

- Habitat cross-sections for PHABSIM analysis is completed SP-G2.
- Rosgen channel classification.
- Description of life history and habitat requirements of non-salmonid fish species in the Feather River is completed SP-F3.2 (Task 2) and SP-F21 (Task 1).

Data Forthcoming:

- Habitat analysis completed Summer 2003, will be linked with habitat suitability information SP-G2.
- Analysis of sediment transport from Fluvial 12 (SP-G2).
- Channel mapping and substrate analysis.

Potential Resource Actions:

- Modify channel slope to create more side-channel habitat for salmonid rearing.
- Gravel replacement on the lower reach spawning riffles if these areas are found to be of poor spawning quality (ongoing, SP-G2).
- Introduction of large instream woody debris.